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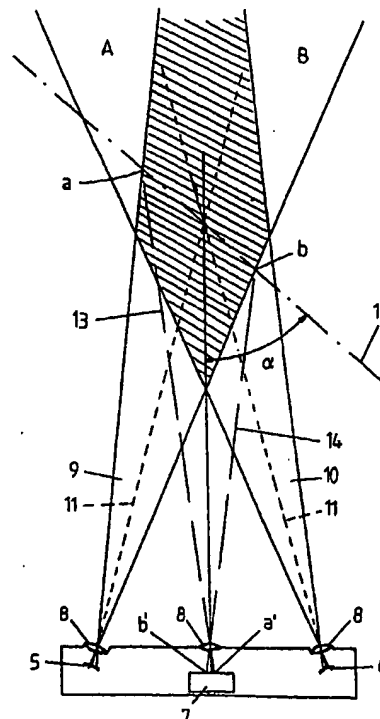
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(54) Title: SIGNAL WARNING DEVICE ON VEHICLES TO ATTRACT THE DRIVER'S ATTENTION

(57) Abstract

Warning device for fitting to a vehicle to attract the driver's attention with a signal when a second vehicle (2) or object finds itself in a position that is wholly or partially critical for the driver. The device includes two sources (5, 6) of electromagnetic radiation located at a distance from each other, a convex lens (8) mounted on the outside of the respective sources plus a position-sensitive radiation detector (7) arranged between sources (5, 6) and also fitted with an externally mounted convex lens (8). The sources (5, 6) and detector (7) are a part of an integrated circuit with the sources modulated to activate with a phase displacement and the beams (8, 9) from sources (5, 6) are adjusted to cut one another at a predetermined distance from the device.



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## SIGNAL WARNING DEVICE ON VEHICLES TO ATTRACT THE DRIVER'S ATTENTION

The present invention concerns a warning device in accordance with the introduction to claim 1.

When, for example, another vehicle is in a position at an oblique angle behind  
5 ones "own" vehicle, usually diagonally behind this own vehicle in relation to the position of  
the driver, it can be difficult to become aware of the presence the other vehicle in the rear  
view mirror, even when this is correctly aligned. It is even more difficult if the mirror is  
somewhat incorrectly aligned and, furthermore, the design of the vehicle usually obstructs the  
eye's peripheral vision from detecting the other vehicle when the driver looks in the rear view  
10 mirror. An additional factor that makes it difficult to detect the second vehicle in this position  
is the stress to which the driver is subjected when driving in heavy traffic that requires  
constant changing of lanes, which is especially the case in busy city traffic.

Several more or less sophisticated devices exist to warn the driver of other  
vehicles positioned within the "dead angle", i.e. at an oblique angle behind their own  
15 vehicle.

US-3,732,536, US 3 568 144, GB 22 65 744 and WO 95/25322 among others  
all relate to detection devices that employ passive ultrasonic receivers or heat sensitive (IR)  
arrangements to detect the presence of a vehicle positioned within the said "dead angle", i.e.  
at an oblique angle behind the vehicle equipped with the said device. The components  
20 included in these arrangements are often located at several different points on the vehicle.  
When the surrounding background noise radiation is taken into account, however, it is almost  
impossible to make these kinds of equipment reliable as warning devices of the type  
intended.

There are also other known devices that are equipped with active scanning units  
25 to detect a vehicle diagonally behind ones own. These active units thus constitute transmitters  
of some kind of pulse as well as receivers of the echo that is returned if the pulses strike an  
object in their path. Examples of such devices are shown in DE-21 43 406 and EP 0 370 965  
A2. These devices use Doppler radar. However, the complexity of these known devices, and  
thus their associated relatively high costs, combined with the high risk of operational  
30 interference, has meant that these known devices have not established themselves in the  
marketplace. There is a great risk that they receive false echoes.

The present invention, as formulated according to the characteristics of the claims, denotes a warning device that draws the driver's attention to another vehicle's or object's critical location in relation to the driver's vehicle without the determination of this position being disturbed by background sound, background light or sunlight and that is at the same time reliable in function and easy to keep clean.

The invention will be described in greater detail in the form of an example with reference to the drawings, where **Fig. 1** is a schematic view of two vehicles where the leading vehicle is equipped with the invention fitted to the rear view mirror, **Fig. 2** shows a very schematic illustration of the warning device according to the invention at a larger scale and **Fig. 3** and **Fig. 4** show examples of two different possibilities for fitting the warning device according to the invention to an outer rear view mirror of a vehicle.

In **Fig. 1**, 1 and 2 designate a first and a second vehicle respectively where the second vehicle 2 is positioned at an oblique angle behind and to the left of the first vehicle 1. In this situation, the position of the second vehicle 2 is critical for the driver of the first vehicle 1 because he or she has great difficulty detecting the second vehicle 2 in the vehicle's rear view mirror, as indicated in the introduction to the description of the patent. The vehicle's 1 rear view mirror is designated 3. The warning device according to the invention is shown in more detail in **Fig. 2**, which illustrates the principle of the invention in a very schematic form. It should be understood that the scale and the geometry of **Fig. 2** is distorted compared with **Fig. 1** in order to make the invention clearer. 4 designates a cover or housing in which two sources of electromagnetic radiation 5, 6 are located at a distance from each other. A position-sensitive radiation detector 7, i.e. a detector that senses the position of an incoming beam and that will be described later, is arranged centrally between sources 5 and 6. The sources of electromagnetic radiation 5, 6 and the position-sensitive radiation detector 7 are part of an integrated circuit where the sources are modulated to be activated with a phase displacement, i.e., they are activated alternately. Laser beams - laser diodes are used as source. As such sources, as well as the position-sensitive radiation detector, are themselves well understood, and as the way in which such components are connected to one another according to what has been specified, constitute a coupling circuit that is only obvious to a skilled person, they do not constitute any part of this invention. A convex lens 8 is mounted on the outside of the respective sources 5 and 6 as well as the radiation detector 7.

The source 5 for electromagnetic radiation emits a pencil beam or a cone of rays 9 and source 6 for electromagnetic radiation emits a pencil beam or a cone of rays 10. To clarify the picture, it should be understood that in this way only beam 9 or beam 10 is active at any one time. The frequency at which the sources of light are modulated to be active can, for example, be 100 Hz. The dashed lines 11 in Fig. 2 designate the centre lines of beams 9 and 10. The dotted/dashed line 12 in Fig. 1 and Fig. 2 designates in an explanatory and simplifying manner the projection of the right-hand side of vehicle 2 in the direction of the first vehicle 1. In the example, it is this right hand side that is expected to reflect beams 9 and 10 as will be described later. As is best made clear in Fig. 1, the example shows that vehicle 2 will move through or cut beams 9 and 10 at the angle which in practice can be in the interval between 15-25°.

When the reflecting part of vehicle 2 penetrates radiation beam 10 from the left side in Fig. 2, i.e. finds itself within the area marked A, the beams reflected to the position-sensitive radiation detector 7 will be registered as reflection only from beam 10. The detector is modulated so that no signal is emitted when this happens. When the second vehicle and its reflecting part penetrates the area where radiation beams 9 and 10 cut across one another, shown as the hatched area in Fig. 1 and Fig. 2, the beams reflected to the radiation detector will be in this case detected from both sources 5 and 6, whereby a signal is emitted, processed and transformed into, for example, a flashing light that is visible to the driver.

Assume that if the second vehicle 2 with its reflecting parts is located in position a in Fig. 2, the reflected beams will follow the path marked by the dashed line 13 and be detected by the position-sensitive beam detector at point a'. If this second vehicle 2 continues in a forward direction relative to the first vehicle 1 and the reflecting part of vehicle 2 reaches point b, the reflected beam 14 will be detected by detector 7 at point b', whereby the detector 7, during this a' - b' movement, emits a signal that can be transformed to, for example, a flashing light that is visible to the driver.

The movement of the second vehicle 2 from point a to point b has in this way caused the beam reflected to the detector 7 to move from a' to b'. The positions of the reflected beams sensed by the detector during this movement from a' to b' are transformed to signals for a board or indicator that shows positional information and that is clearly visible to the driver and that, by means of lights, symbols or similar, informs the driver about the second vehicle's presence in relation to his own. The reflected beam's positions between a'

and b' can naturally be detected and signal-processed so that a light, for example, only informs the driver that the vehicle is situated in the area known as the "dead angle".

As it requires two alternating beams to be reflected from an object to the detector for this to emit the correct signals, only the hatched area in Fig. 1 and 2 will  
5 comprise the "detection area". By varying the angle of the beam's rays and the angle at which they cut across one another, the hatched area can be chosen so that the greatest possible effectiveness can be achieved by the device. Designing the device in this way effectively minimises or eliminates all background interference or noise because the device's effective sensing zone is limited in space.

10 Fig. 3 and Fig. 4 show examples of two different installations of the device according to the invention on a rear view mirror of a vehicle. Fig. 3 shows the device 4 placed above the mirror and Fig. 4 shows the device 4 placed vertically to the side of the mirror. The device according to the invention can be manufactured as an accessory to existing rear view mirrors or can naturally be integrated with such during new production.  
15 The light or lights that by blinking call the driver's attention to the presence of a vehicle diagonally behind his own vehicle can be arranged on the rear view mirror adjacent to the present warning device or be situated within the vehicle. Probably the most appropriate placement would be the first alternative as the driver still has to look in the rear view mirror. Audible signals can also be used.

20 The invention presented is very simple to construct and is effective, at the same time as it is inexpensive to manufacture with regard to the components that are included.

Within the scope of the invention, it is natural to think that the device can also be used as an aid when vehicles are reversing and can on these occasions by being fitted to the rear of the vehicle inform the driver when it reaches a certain distance from, for example,  
25 a loading bay. The device according to the invention can even be used to help maintain the distance to vehicles travelling in front to give warning of such during, for example, fog or darkness.

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### Claims

1. Warning device for fitting to a vehicle that uses a signal to attract the driver's attention when a second vehicle (2) or object finds itself in a position that is wholly or partially critical for the driver characterised in that it includes two sources (5, 6) of  
5 electromagnetic radiation located at a distance from each other plus a convex lens (8) mounted on the outside of the respective sources, a position-sensitive radiation detector (7) arranged between sources (5, 6) also fitted with an externally mounted convex lens (8), whereby the sources (5, 6) and detector (7) are a part of an integrated circuit with the sources modulated to activate with a phase displacement and that beams (9,10) from sources (5, 6)  
10 are adjusted to cut one another at a predetermined distance from the device.

2. Warning device according to claim 1 characterised in that the position-sensitive radiation detector (7) is set up to emit signals that attract the attention of the driver only when the detector receives reflected beams from both sources (5, 6).

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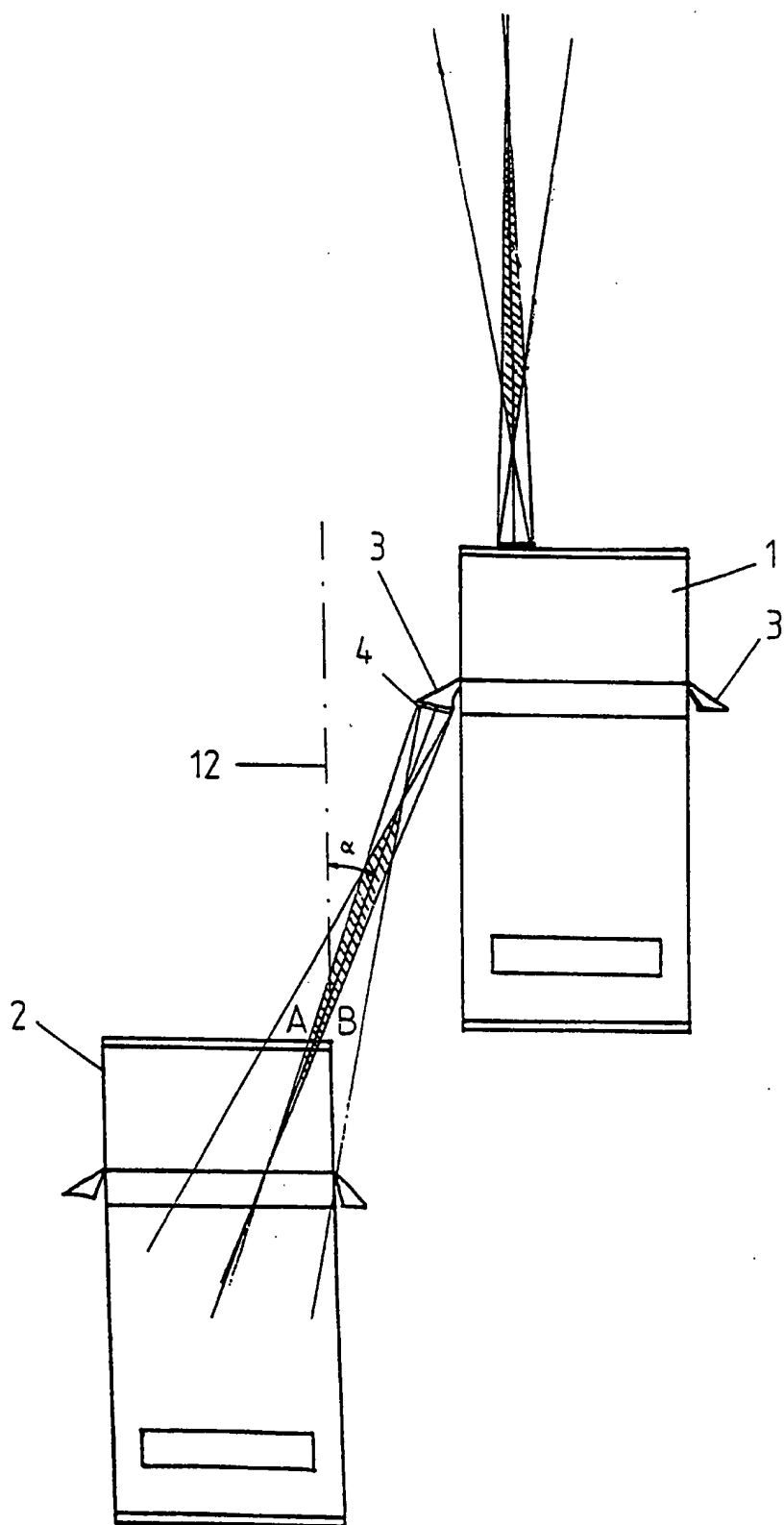


Fig 1

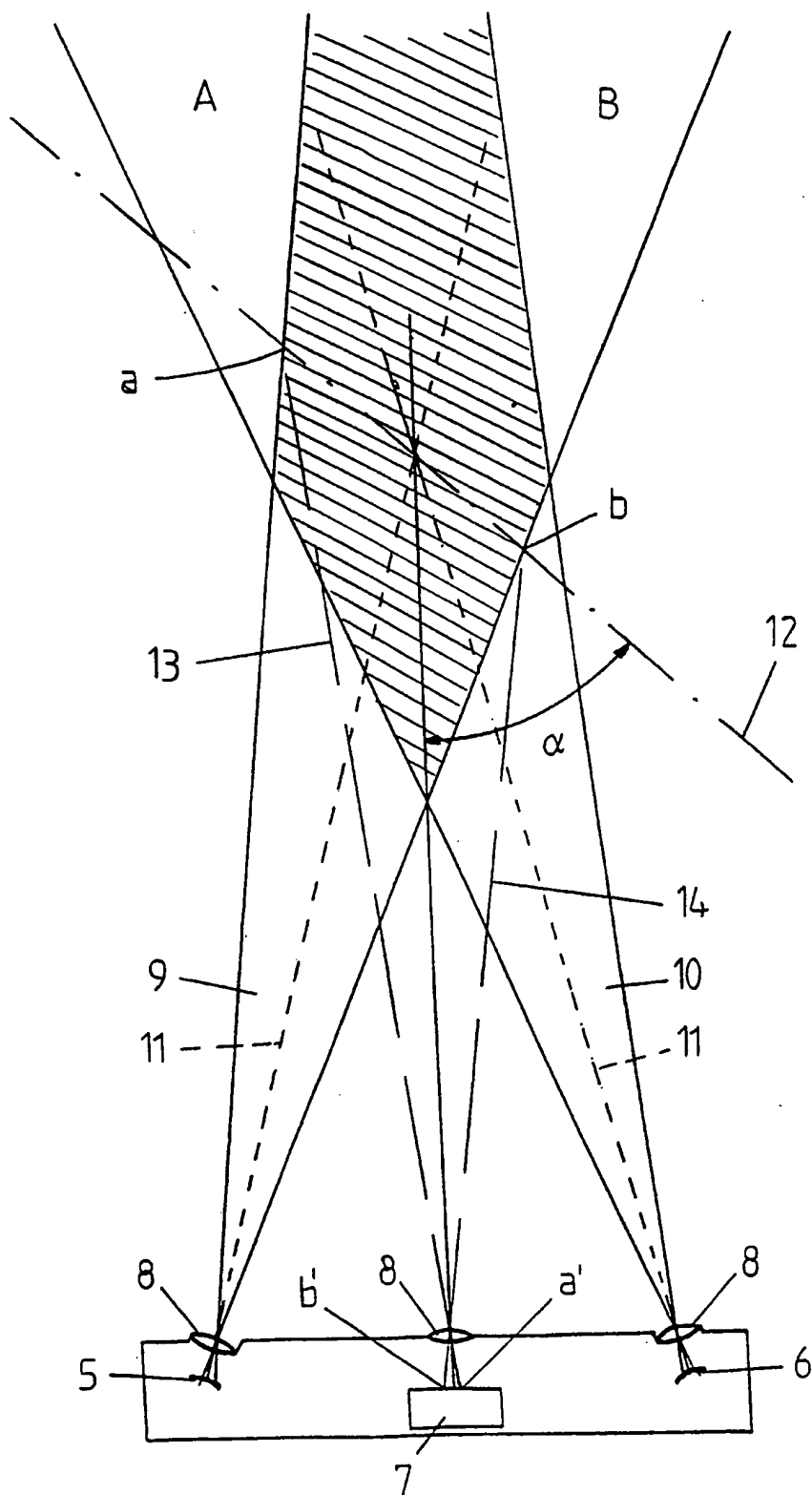


Fig 2

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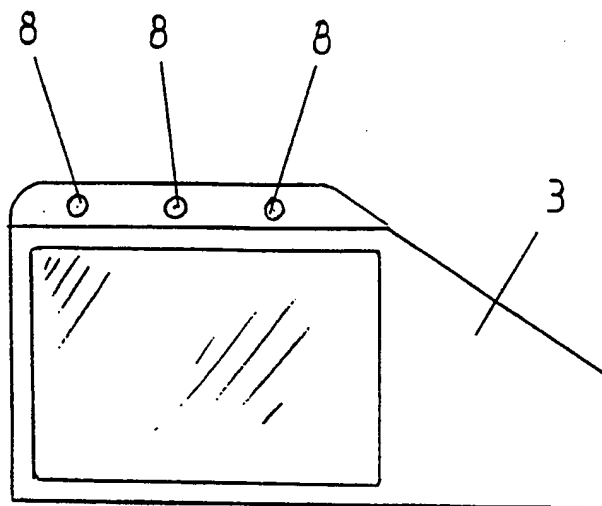


Fig 3

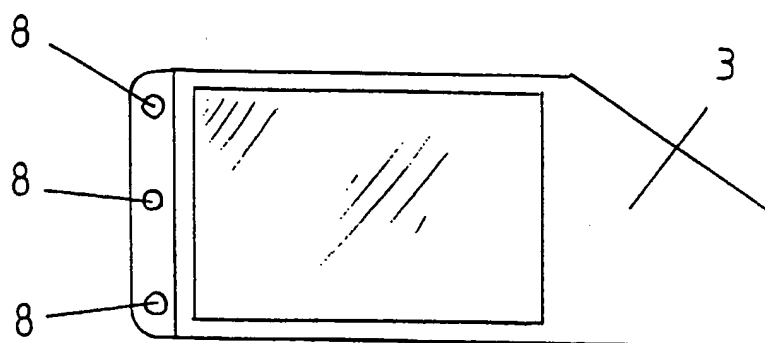


Fig 4

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 98/00097

## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: G01S 17/93, G08G 1/16, B60R 1/12

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages  | Relevant to claim No. |
|-----------|---|-----------------------|
| Y         | DE 2455733 A1 (SACK, FRIEDRICH), 26 May 1976<br>(26.05.76)<br><br>--  | 1-2                   |
| Y         | Patent Abstracts of Japan, Vol 8, No 208, P-302<br>abstract of JP 59-92372 A (NIPPON JIDOSHA BUHIN<br>SOGO KENKYOSHO K.K.), 28 May 1984 (28.05.84)<br><br>--<br>----- | 1-2                   |

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Information on patent family members

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|---|---------------------|----------------------------|---------------------|
| DE 2455733 A1                             | 26/05/76            | NONE                       |                     |